Volume 2, Issue 6 ■ 10FEB2012

S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

Feature Articles

(PhysOrg.com) A novel material developed by researchers at the University of Cambridge is opening up new possibilities for next generation electronic and optoelectronic devices, and paving the way for further component miniaturisation. Photo credit: Andrew Flewitt

New form of hafnium oxide developed

PhysOrg.com, 07FEB2012

A novel material developed by researchers at the University of Cambridge is opening up new possibilities for next generation electronic and optoelectronic devices, and paving the way for further component miniaturisation. The material is produced at room-temperature, using high-deposition rate process HiTUS (High Target Utilisation Sputtering), making it particularly suitable for plastic electronics and high-volume semiconductor manufacturing. The absence of grain boundaries makes the material ideal for optical coatings and more efficient solar cells. This form of hafnium oxide has a dielectric constant higher than 30.

Tags: Advanced materials, Materials science, Featured Article

Physicists 'record' magnetic breakthrough

University of York (UK), 07FEB2012

York physicist Thomas Ostler said: "Instead of using a magnetic field to record information on a magnetic medium, we harnessed much stronger internal forces and recorded information using only heat. This revolutionary method allows the recording of Terabytes (thousands of Gigabytes) of information per second, hundreds of times faster than present hard drive technology. As there is no need for a magnetic field, there is also less energy consumption." TECHNICAL ARTICLE: T.A. Ostler, ET AL., "Ultrafast heating as a sufficient stimulus for magnetization reversal in a ferrimagnet" Nature Communications, Tuesday, 7 February.

Tags: Breakthrough technology, S&T EU, Featured Article

S&T News Articles

ADVANCED MATERIALS

Engineers weld nanowires with light

R&D Magazine, 06FEB2012

The technique developed by Stanford University researchers harnesses plasmonics to fuse wires with a simple blast of light. Their work could lead to innovative electronics and solar applications. In addition to making it easier to produce stronger and better performing nanowire meshes, the researchers say that the new technique could open the possibility of mesh electrodes bound to flexible or transparent plastics and polymers.

Tags: Advanced materials, Nanomaterials

Searching for a solid that flows like a liquid

R&D Magazine, 02FEB2012

A series of neutron scattering experiments at Oak Ridge National Laboratory and other research centers is exploring the key question about a long-sought quantum state of matter called supersolidity: Does it exist?

Tags: Advanced materials, Materials science

AUTONOMOUS SYSTEMS & ROBOTICS

A military robot that does it all - iRobot 710 Warrior

Kurzweil AI, 07FEB2012

With the official launch of the iRobot Warrior, a large

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wheeled robot with a hefty mechanical arm, military robots just got significantly larger and more adaptable. The robot can climb stairs and cover rough terrain, and perform tasks ranging from the delicate (opening car doors) to the destructive (smashing car windows) with its two-meter-long mechanical arm, and could be weaponized—in one test it launched a rocket that trailed explosives behind it to clear mines or other obstacles. Video

Tags: Autonomous systems & robotics, Military technology

International Conference on Unmanned Systems - AUVSI Israel 2012 [March 20-22, 2012, Tel Aviv]

Defense Update, 07FEB2012

For four decades Israel's aerospace industries are maintaining their world leading position in the field of unmanned systems. The upcoming International Conference on Unmanned Systems will offer international delegates a unique insight into one of the country's most competitive fields of expertise. Selected Israeli UAV companies web sites

Tags: Autonomous systems & robotics

New Submarines Improve Performance

Aviation Week, 02FEB2012

Major advances have included air-independent propulsion (AIP) systems, increasing submerged endurance and mobility; automation, reducing crew size (and consequently, life-cycle costs) and improving habitability; electro-optical masts that can sweep the horizon with high-definition in seconds and drop out of sight; and new torpedoes and other weapons. On the near horizon is the mating of SSKs with unmanned air and underwater vehicles (UUV).

Tags: Autonomous systems & robotics, Military technology

Studying Butterfly Flight to Help Build Bug-Size Flying Robots

Newswise, 02FEB2012

Johns Hopkins engineers have been aiming high-speed video cameras at some of the prettiest bugs on the planet. By figuring out how butterflies flutter among flowers with amazing grace and agility, the researchers hope to help small airborne robots mimic these maneuvers. Research is sponsored by AFOSR. Video

Tags: Autonomous systems & robotics, Biomimetics, Micromachines, Microrobots

Robot reconnoiters uncharted terrain

Fraunhofer Research, 01FEB2012

Researchers at the Fraunhofer Institute for Optronics (Germany) have now developed a roaming land robot that autonomously reconnoiters and maps uncharted terrain. Cameras and laser scanners record the environment and assist in the mapping process. The algorithms read the various data supplied by the sensors and use them to determine the robot's precise location. The interplay of all these different elements concurrently produces a map, which is updated continuously. Experts call the process Simultaneous Localization and Mapping, or SLAM.

Tags: Autonomous systems & robotics, Robotics

Swarming Quadrotors Get Nano-ized

IEEE Spectrum, 01FEB2012

UPenn's GRASP Lab shows off some cool tricks with a swarm of tiny little quatrotors. One advantage of having smaller quadrotors (besides sound even more like a swarm of giant angry bees) is that you can cram more of them into a given space, allowing you to perform more complex swarm behaviors. And, as you can see from the video, they're eminently tossable, and it sort of looks like you can just chuck 'em like ninja stars and they'll self-right and stabilize themselves. Video

Tags: Autonomous systems & robotics, Nanomachines

BREAKTHROUGH TECHNOLOGY

Higgs signal gains strength

Nature News, 07FEB2012

Today the two main experiments at the Large Hadron Collider (LHC) submitted the results of their latest analyses. The new papers boost the case for December's announcement of a possible Higgs signal, but let's not get too excited.

Tags: Breakthrough technology

ENERGY

Energy department to launch new energy innovation hub focused on advanced batteries and energy storage

EurekAlert, 07FEB2012

Secretary of Energy Steven Chu announced today plans to launch a new Energy Innovation Hub for advanced research on batteries and energy storage with an investment of up to $120 million over five years. The hub, which will be funded at up to $20 million in fiscal year 2012, will focus on accelerating research and development of electrochemical energy storage for transportation and the electric grid.

Tags: Energy, Government S&T, S&T Policy

This Robotic Black Box Will Make Your Life Warmer

IEEE Spectrum, 06FEB2012

Hagent, as the robot is called, has some wheels, some sensors, and a big pile of phase-change material. Phase-change material (or PCM for short) is something that stores or releases energy when it changes from a solid to a liquid (or any other combination of phases) or vice versa. Hagent takes that heat storage concept and mobilizes it for the purposes of using energy more efficiently and keeping you cozy when it's cold out.

Tags: Energy

continued...

"To raise new questions, new possibilities, to regard old problems from a new angle, requires creative imagination and marks real advance in science." ALBERT EINSTEIN

Harnessing nature's solar cells

Nanowerk, 03FEB2012

Researchers at MIT derived the PS-I [the tiny structures within plant cells that carry out photosynthesis] from plants, stabilized it chemically and formed a layer on a glass substrate that could — like a conventional photovoltaic cell — produce an electric current when exposed to light. Now they have achieved huge improvement in efficiency by exposing much more of the PS-I complex per surface area of the device to the sun. Video

Tags: Energy, Solar energy

Wireless power that is 97 percent efficient could revolutionize highway transportation

Next Big Future, 01FEB2012

A Stanford University research team has designed a high-efficiency charging system that uses magnetic fields to wirelessly transmit large electric currents between metal coils placed several feet apart. The long-term goal of the research is to develop an all-electric highway that wirelessly charges cars and trucks as they cruise down the road.

Tags: Energy, Science without borders

FOREIGN S&T

Theoretical-physics hub opens in South America

Physics World, 07FEB2012

A new centre for theoretical physics has opened in Brazil that aims to become one of the leading research institutes in South America. The centre expects to support about a dozen postdocs positions per year as well as playing host to a number of international visitors and students.

A centre located in Brazil can play the same role for South America that ICTP (International Centre for Theoretical Physics) has been playing worldwide.

Tags: Foreign S&T, S&T Policy

Playing RFID tag with sheets of paper

Nanowerk, 06FEB2012

Researchers at the University of Montpellier (France) have demonstrated how a simple thermal evaporation process can deposit an aluminum coil antenna on to paper for use as an RFID tag. Aluminum is a lot less expensive than copper or silver, which are used in some types of RFID tag. The researchers suggest that the approach would reduce the cost of RFID tagging to a fifth of current prices.

Tags: Foreign S&T, S&T France

Nuclear approvals to be resumed at slower rate

China Daily, 02FEB2012

China will be cautious in pursuing nuclear power and is likely to approve only three or four projects each year, compared with the boom in new projects during the 11th Five-Year Plan period (2005-2010). China is also developing its first domestic 3G nuclear reactor - the CAP 1400 - which is based on the AP1000 and will boost the unit's generating capacity to 1,400 megawatts (mW) from 1,154 mW.

Tags: Foreign S&T, Nuclear energy, S&T China

GOVERNMENT S&T

DARPA's SyNAPSE program named one of best innovations of 2011

Nanowerk, 06FEB2012

The DARPA Systems of Neuromorphic Adaptive Plastic Scalable Electronics (SyNAPSE) is developing integrated circuits with high densities of electronic devices and integrated communication networks that approximate the function and connectivity of neurons and synapses. Continuing efforts seek to improve the production of electronic components, create enhanced system architecture and design tools, and realize virtual environments for training and testing.

Tags: Government S&T, DARPA

Physicists create first 'frequency comb' to probe ultraviolet wavelengths

PhysOrg.com, 01FEB2012

Physicists at JILA (joint venture of NIST and U Colorado) have created the first "frequency comb" in the extreme ultraviolet band of the spectrum, high-energy light less than 100 nanometers (nm) in wavelength. The new tool can aid in the development of "nuclear clocks" based on ticks in the nuclei of atoms, and measurements of previously unexplored behavior in atoms and molecules.

Tags: Government S&T

INFORMATION TECHNOLOGY

Engineers boost computer processor performance by over 20 percent

EurekAlert, 07FEB2012

Researchers from North Carolina State University have developed a new technique that allows graphics processing units and central processing units on a single chip to collaborate -- boosting processor performance by an average of more than 20 percent.

Tags: Information Technology

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Scientists develop biological computer to encrypt and decipher images

Nanowerk, 07FEB2012

Scientists at The Scripps Research Institute in California and the Technion-Israel Institute of Technology have developed a "biological computer" made entirely from biomolecules that is capable of deciphering images encrypted on DNA chips. Although DNA has been used for encryption in the past, this is the first experimental demonstration of a molecular cryptosystem of images based on DNA computing.

Tags: Information Technology, Microelectronics

Featured Resource

Horizon Scanning Centre (UK)

Our goal is to support the use of evidence-based futures thinking in developing more innovative Government strategies and policies which are resilient to different future outcomes.

MATERIALS SCIENCE

Bullet Proof Polymer with equal parts graphene and carbon nanotubes tougher than Kevlar

Next Big Future, 03FEB2012

University of Wollongong (Australia) researchers have used graphene to develop a new composite material. The super tough fibres can be produced easily by a wet-spinning method and can be readily up-scaled. In this case, fibres were spun by collaborators at the Centre for Bio-Artificial Muscle at Hanyang University, Korea.

Tags: Materials science, Foreign S&T, Military technology, Nanomaterials

A Spider Web's Strength Lies in More Than its Silk

NSF News, 01FEB2012

A study that combines experimental observations of spider webs with complex computer simulations shows that web durability depends not only on silk strength, but on how the overall web design compensates for damage and the response of individual strands to continuously varying stresses. Engineered structures are typically designed to withstand large loads with limited damage, but extreme loads are more difficult to account for. The spider has uniquely solved this problem by allowing a sacrificial member to fail under high load so that the entire web may survive.

Tags: Materials science, Biomimetics

MICROELECTRONICS

Graphene electronics moves into a third dimension

EurekAlert, 02FEB2012

Wonder material graphene has been touted as the next silicon, with one major problem - it is too conductive to be used in computer chips. Now scientists from the University of Manchester have given its prospects a new lifeline.

Tags: Microelectronics, Nanomaterials

Computer memory with 3.3 Terabits per square inch

Next Big Future, 01FEB2012

Researchers at ASTAR (Singapore) have developed a new method to increase computer memory using bit-patterned media (BPM). The team has demonstrated the fabrication of BPM with densities as high as 3.3 terabits per square inch — or 15 nanometer pitch — using a method that does not require pattern transfer processes such as etching and liftoff, which typically reduce pattern fidelity.

Tags: Microelectronics, Information technology

Researchers find molybdenite may be better suited for integrated logic circuits than graphene

PhysicsOrg.com, 01FEB2012

Because of its physical limitations, silicon use in tiny integrated logic circuits will have to one day soon be replaced by something that can work in a smaller state. For several years, graphene has been seen as the most likely heir to the throne because it's only one atom thick. The problem with graphene though, is that it's not a semiconductor in its natural state; it has to be put through special processes to make it so. Molybdenite (MoS_2), on the other hand is a true semiconductor and it, like graphene can be produced in atom thick sizes, perhaps making it the ideal material to replace silicon.

Tags: Microelectronics, Semiconductors

NEUROSCIENCE

Neuroscience could mean soldiers controlling weapons with minds

The Guardian, 07FEB2012

Neuroscience breakthroughs could be harnessed by military and law enforcers, says Royal Society, UK's National academy of Science report, Neuroscience, Conflict and Security. Soldiers could have their minds plugged directly into weapons systems, undergo brain scans during recruitment and take courses of neural stimulation to boost their learning, if the armed forces embrace the latest developments in neuroscience to hone the performance of their troops.

Tags: Neuroscience, Military technology, Science without borders

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QUANTUM SCIENCE

NASA Quantum Future Technologies Conference

NASA, 07FEB2012

This conference aims to bring together NASA scientists with the best quantum technology experts from academia, government and industry to identify the areas and challenges in Space Exploration, Aeronautics, Earth and Space Science where quantum technologies can have the greatest impact. The conference will focus on 3 areas: Quantum Measurement (QM), Quantum Computing (QC) and Quantum cryptography and key distribution (QK). Videos and Conference agenda from the NASA Quantum Future Technologies Conference.

Tags: Quantum science, NASA

Quantum connection between light and motion

R&D Magazine, 06FEB2012

Physicists have demonstrated a system in which light is used to control the motion of an object that is large enough to be seen with the naked eye at the level where quantum mechanics governs its behavior.

Tags: Quantum science

Quantum microphone captures extremely weak sound

PhysicsOrg.com, 06FEB2012

A "quantum microphone" based on a Single Electron Transistor (SET) detects sound waves on a chip surface, so called Surface Acoustic Waves (SAW). The waves make the charge of the atoms underneath the quantum microphone oscillate. Since the quantum microphone is an extremely sensitive charge detector, very low sound levels can be detected.

Tags: Quantum science, Sensors

Improved understanding of magnetism and electrons could help enable advanced spintronics

Next Big Future, 03FEB2012

Knowing how to control the combined magnetic properties of interacting electrons will provide the basis to develop an important tool for advancing spintronics: a technology that aims to harness these properties for computation and communication.

Tags: Quantum science, Communications Technology

S&T POLICY

New investment aims to establish the UK as a global graphene research hub

EurekAlert, 06FEB2012

A key element of the graphene hub will be a national institute of graphene research and commercialisation activities. The University of Manchester, an acknowledged research leader in graphene research, has been confirmed as the single supplier invited to submit a proposal for funding a new £45 million national institute. The national institute will offer access to specialist facilities and equipment which enable the simulation of manufacturing processes.

Tags: S&T policy, S&T EU

New methodology assesses risk of scarce metals

PhysOrg.com, 06FEB2012

The criticality methodology evaluates supply risk for entities that use metals on the basis of three components: geological, technological and economic; social and regulatory. This is the first time that this topic has been addressed in the peer-reviewed literature.

Tags: S&T policy

Report Identifies 16 Highest Priorities to Guide NASA's Technology Development Efforts for Next Five Years

National Academy of Sciences, 01FEB2012

The 16 high-priority technologies were selected with input from the external technical community as part of NASA's draft technology roadmaps and include items such as radiation mitigation; guidance, navigation, and control; nuclear systems for both power generation and transportation; and solar power generation (see table in the article). NRC Report can be downloaded for free with registration.

Tags: S&T policy, Government S&T

SCIENCE WITHOUT BORDERS

2011 International Science and Engineering Visualization Challenge winners announced

EurekAlert, 02FEB2012

These winners communicate science in a manner that not only captures your attention but in many instances strives to look at different ways to solve scientific problems through their varied art forms. See images/videos at NSF's website.

Tags: Science without borders

Not a scratch - Scorpions may have lessons to teach aircraft designers.

The Economist, 02FEB2012

The north African desert scorpion, Androctonus australis, is a hardy creature. When the sand whips by at speeds that would strip paint away from steel, the scorpion is able to scurry off without apparent damage. Researchers found that Androctonus armour is covered with dome-shaped granules that are 10 microns high and between 25 and 80 microns across. These were the key to its insouciance in the face of sandstorms. The lesson for aircraft makers is that a little surface irregularity might help to prolong the active lives of planes and helicopters, as well as those of scorpions.

Tags: Science without borders, Biomimetics

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The Secret of Ant Transportation Networks

MIT Technology Review, 02FEB2012

Researchers in Argentina think they've cracked the secret. Among the most impressive transportation networks on the planet are the complex trails that ants create around their nests. These networks arise through the ants' exploration of their environment and end up channelling the distribution of food for the colony and the daily movements of hundreds of thousands of individuals.

Tags: Science without borders, Biomimetics

SENSORS

Innovation promises expanded roles for microsensors

Nanowerk, 07FEB2012

Researchers at Perdue University have learned how to improve the performance of sensors that use tiny vibrating microcantilevers to detect chemical and biological agents for applications from national security to food processing. The aim is to apply the new approach to build sensors capable of reliably measuring particles that have a mass of less than one picogram - or trillionth of a gram - at room temperature and atmospheric pressure.

Tags: Sensors, Counter WMD

NYPD Developing THz Body Scanners to Detect Weapons, But Application May Still Be Years Away

THz Science and Technology, 01FEB2012

The technology will use a vehicle mounted device to detect radiation emitted from a person's body. Images captured by the device could reveal a gun underneath a person's clothing.

Tags: Sensors

STEM

New Obama plan to help math, science teacher prep

PhysicsOrg.com, 07FEB2012

Upcoming budget proposal would include a request for $80 million from Congress for a new Education Department competition to support math and science teacher preparation programs. Obama made a similar request to Congress last year but the measure didn't pass. Separately, he announced $22 million in investments from the private sector to support math and science efforts.

Tags: STEM

Indiana launches new ultra-high-speed network

PhysOrg.com, 01FEB2012

Indiana is the first state to launch a high-speed 100-gigabits-per-second (Gbps) network link dedicated to research and education. The new network, named Monon100, is 10 times faster than the current network link. With it, scientists and medical researchers will be able to rapidly share the massive amounts of data created by modern digital instruments such as gene sequencers, powerful microscopes or the Large Hadron Collider.

Tags: STEM ■

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